PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : H04J 3/16, 3/24 — A1

(11) International Publication Number: WO 95/01015

(43) International Publication Date: 5 January 1995 (05.01.95)

(21) International Application Number: PCT/FI94/00268

(22) International Filing Date: 16 June 1994 (16.06.94)

(30) Priority Data:
932917 23 June 1993 (23.06.93) FI

(71) Applicant *(for all designated States except US)*: NOKIA TELECOMMUNICATIONS OY [FI/FI]; Mäkkylän puistotie 1, FIN-02600 Espoo (FI).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: SUONVIERI, Jukka [FI/FI]; Kotikuusentie 2 C 2, FIN-90240 Oulu (FI).

(74) Agent: OY KOLSTER AB; Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).

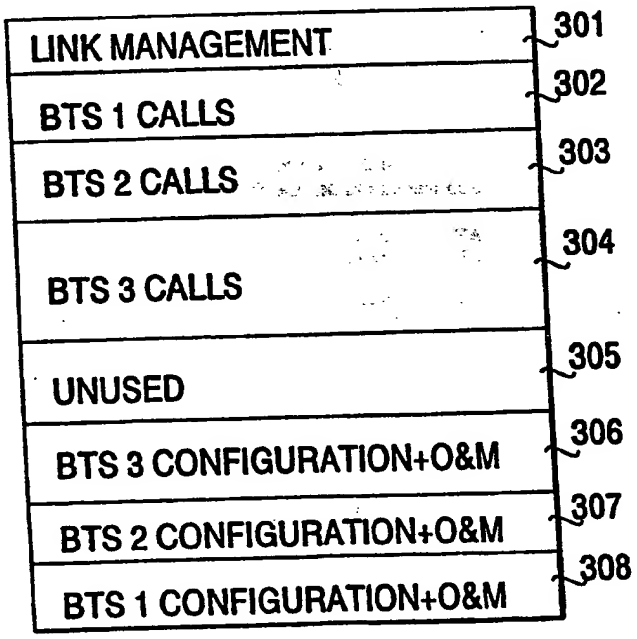
(81) Designated States: AU, CN, DE, GB, JP, NO, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.
In English translation (filed in Finnish).

(54) Title: DATA TRANSMISSION METHOD AND DATA TRANSMISSION SYSTEM IN A CELLULAR RADIO NETWORK

(57) Abstract

A data transmission method in a cellular radio system, comprising as network elements a base station controller and base stations connected in series thereto via data transmission links; in themethod, data is transmitted over said data transmission links in frames divided into timeslots. To control the data transmission network formed by the data transmission links, configuration data (308) indicating in which timeslots of the frame the useful data (302) intended for the network element is carried is transmitted to the network element in a predetermined timeslot (308) of the frame.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**GB**	United Kingdom	**MR**	Mauritania
AU	Australia	**GE**	Georgia	**MW**	Malawi
BB	Barbados	**GN**	Guinea	**NE**	Niger
BE	Belgium	**GR**	Greece	**NL**	Netherlands
BF	Burkina Faso	**HU**	Hungary	**NO**	Norway
BG	Bulgaria	**IE**	Ireland	**NZ**	New Zealand
BJ	Benin	**IT**	Italy	**PL**	Poland
BR	Brazil	**JP**	Japan	**PT**	Portugal
BY	Belarus	**KE**	Kenya	**RO**	Romania
CA	Canada	**KG**	Kyrgyzstan	**RU**	Russian Federation
CF	Central African Republic	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CG	Congo			**SE**	Sweden
CH	Switzerland	**KR**	Republic of Korea	**SI**	Slovenia
CI	Côte d'Ivoire	**KZ**	Kazakhstan	**SK**	Slovakia
CM	Cameroon	**LI**	Liechtenstein	**SN**	Senegal
CN	China	**LK**	Sri Lanka	**TD**	Chad
CS	Czechoslovakia	**LU**	Luxembourg	**TG**	Togo
CZ	Czech Republic	**LV**	Latvia	**TJ**	Tajikistan
DE	Germany	**MC**	Monaco	**TT**	Trinidad and Tobago
DK	Denmark	**MD**	Republic of Moldova	**UA**	Ukraine
ES	Spain	**MG**	Madagascar	**US**	United States of America
FI	Finland	**ML**	Mali	**UZ**	Uzbekistan
FR	France	**MN**	Mongolia	**VN**	Viet Nam
GA	Gabon				

Data transmission method and data transmission system in a cellular radio network.

Field of the Invention

The invention relates to a data transmission method and a data transmission system in a cellular radio system, comprising as network elements a base station controller and base stations connected in series thereto via data transmission links; in the method, data is transmitted over said data transmission links in frames divided into timeslots.

Background of the Invention

In cellular radio systems, it is known to connect a plurality of base stations in series with one another by means of data transmission links in such a way that a plurality of base stations are controlled by one base station controller. The base station controller transmits data to each base station through other base stations in a certain predetermined timeslot of the data transmission link. These timeslots are fixed, i.e. the incoming and outgoing traffic of a base station are always carried in the same timeslot/timeslots. Fig. 1 shows a block diagram in which a Base Transceiver Station BTS 1 is connected to a Base Station Controller BSC. Fig. 2 shows base stations BTS 1, BTS 2 and BTS 3 connected in series in such a way that they communicate with the base station controller BSC through one another. An example for data transmission links used for carrying traffic between the base stations of a cellular radio network is a so-called Abis interface described in the GSM recommendations "GSM 12.21, 1992, Network Management Procedures and Messages on the Abis Interface, ETSI" and "GSM 08.54, 1992, BSC-BTS-Layer 1 Specification, ETSI". The Abis interface is divided into

timeslots in the manner shown in fig. 9. The interface may have e.g. 32 timeslots of 64 kbit/s. When it has been necessary to change, e.g. increase, the amount of data transmitted to the base station, it has been possible to allocate a plurality of timeslots of a data transmission link to a specified base station. This has been implemented such that the base station controller has started to transmit data to each base station in a new timeslot and the base stations have been moved to receive incoming data from the correct timeslots. Typically, the base stations have been moved to receive data transmitted in the correct timeslots by manually modifying the configuration data of the data transmission link in the files of each base station.

In the above solution of the prior art, the number of data transmission links between the base stations of the network, i.e. the configuration of the network, can be modified only manually in such a way that the maintenance personnel checks on all the base stations to be modified and allocates the timeslots needed by means of the operation and maintenance unit of each base station. This is laborious, and if one data transmission link of a network formed by a plurality of base stations is allocated wrong, it may be necessary to re-configure the entire system. In this kind of prior art system, it is impossible to flexibly modify the network structure, i.e. the transmission capacity allocated for connections between different base stations and base station controllers or switching centres. It is thus impossible to modify the transmission capacity of the different base stations e.g. daily, depending on, for example, which base station has the heaviest traffic load. This kind of characteristic would be very useful for mobile phone operators in urban and suburban areas. When a system is used in which transmission capacity can

be flexibly allocated to different base stations, the operators are not charged for the maximum transmission capacity between the base stations and the base station controller or switching centre, since it is possible to allocate transmission capacity for each connection in the amount needed. Another drawback of the prior art system is that due to manual configuration of the transmission links of the network, it is difficult to manage the network described in the prior art since the network cannot be managed from one point but each base station must be checked on separately when the configuration of the network is to be modified. Further, it is difficult for the system described in the prior art to recover from a fault since a faulty timeslot cannot be flexibly replaced by another timeslot and since a faulty connection e.g. in a ring-formed base station network cannot be replaced by establishing another transmission link to the base station from the other direction of the ring.

Disclosure of the Invention

The object of the present invention is to provide a data transmission method and system by which the above problems of the prior art can be avoided. The object of the invention is also to enable flexible allocation of data transmission links between the base stations of the cellular radio network in such a way that the timeslots of the data transmission links can be flexibly allocated to different base stations. The object of the invention is thus to automate and facilitate the setting up or configuration of the structure of the data transmission network between the base station and the base station controller or switching centre.

This new kind of data transmission method is achieved with the method of the invention, which is

characterized in that configuration data indicating in which timeslots of the frame the useful data intended for the network element is carried is transmitted to the network element in a predetermined timeslot of the frame.

Further, the data transmission system according to the invention is characterized in that configuration data indicating in which timeslots of the frame the useful data intended for the network element is carried is transmitted to the network element in a predetermined timeslot of the frame.

The basic idea of the invention is that a certain channel, typically a timeslot, is assigned for network management. The configuration data, i.e. the data by means of which the base stations find the data channels, typically voice channels, allocated to them are transmitted to the base stations on this network management channel. Another basic idea of the invention is that all the base stations look for configuration data intended for them in the same predetermined timeslot, and in the base station network a preceding base station places the configuration data intended for the following base station in that same predetermined timeslot. This predetermined timeslot may be the last timeslot of the frame on a data transmission link, whereby the data stream passing through the base station is redivided such that the base station that is logically the following base station in the network finds the control data intended for it in the last timeslot intended for it.

The advantage of a data transmission method and system according to the present invention is that according to the method and system of the invention, the structure of the base station network, i.e. the number of the transmission lines allocated to each base station

and their location over the transmission link, can be changed quickly and without any difficulties. This can be performed when considered necessary, and especially when the loading of the base stations varies and the number of the transmission links allocated to them is to be changed.

Another advantage of the invention is that a base station is quicker and easier to install in the network since the person installing the base station need not program the base station on the spot as part of the network but the system automatically connects the base station to the network.

Also, since the network can be managed and the configuration of the transmission links between the base stations modified by the base station controller or switching centre in a centralized manner, the work of the person installing the base station is essentially facilitated. The installer of the base station need not be familiar with the structure of the whole base station network. Also, the method and system according to the invention reduce occurrence of faults and malfunctions in the base station network.

An advantage of the invention is that the structure of the base station is easier to control. The data about the structure of the base station can thereby be displayed on the base station controller and the configuration of the network can be easily changed from one point in the network.

Another advantage of the method and system according to the invention is that certain failures occurring in the network can be quickly and reliably overcome by the automatization and concentration of the network management according to the invention. For example, if the configuration data is always placed in the same predetermined timeslot, a base station in the

network can always easily detect the configuration data intended for it in the same timeslot. If a link in a ring-formed network is disconnected, the configuration data of the network can then be transmitted to the opposite direction in the network, and thus the base station network can be re-configured and it starts to operate again despite the disconnection of the link.

Another advantage of the invention is that a base station network operating in accordance with the invention needs less transmission capacity for allocation of data channels, such as voice channels, between the base stations and the base station controller or switching centre.

Brief Description of the Drawings

In the following the invention will be described in greater detail with reference to the attached drawings, wherein

Fig. 1 shows a block diagram of a base station controller and a base station connected thereto via a data transmission link,

Fig. 2 shows a block diagram of a base station controller and of base stations connected in series thereto via a data transmission link,

Fig. 3 shows a schematic view of a data transmission frame of the invention over a data transmission link between a base station controller and a first base station,

Fig. 4 shows a schematic view of a data transmission frame of the invention over a data transmission link between a first and second base station,

Fig. 5 shows a schematic view of allocation of data transmission channels to different base stations,

Fig. 6 shows a block diagram and a functional diagram of a data transmission system and method according to the invention,

Fig. 7 shows a schematic view of cross-connection of timeslots,

Fig. 8 shows as a flow diagram how the configuration of a data transmission network according to the invention is modified,

Fig. 9 shows a schematic view of the frame structure of an Abis interface,

Fig. 10 shows a schematic view of a base station network to which the base stations are connected via their transmission means,

Fig. 11 shows a flow diagram of the configuration of a base station network.

Detailed Description of the Invention

Figs. 1 and 2 are described above at the beginning of the specification.

Fig. 3 shows a frame structure of a data transmission link between a base station controller and a first base station. In the frame shown in Fig. 3, the link managing information is placed e.g. in a first timeslot 301. The following timeslots contain first the calls or other data 302 intended for the first base station BTS 1. The following timeslots contain the useful data, such as calls, intended for the second 303 base station BTS 2 and the third 304 base station BTS 3. The following field 305 is not in use, and the field 306 contains the configuration data used by the third base station BTS 3; on the basis of this data the third base station detects the useful data intended for it, placed in the field 304. The field 307 contains the configuration data intended for the second base station BTS 2, by which the second base station BTS 2 detects

the useful data intended for it, placed in the field 303. Further, the field 308 contains the configuration data intended for the following base station, i.e. the first base station BTS 1; by this data the first base station detects the useful data 302, such as a voice channel, intended for it. The configuration data intended for the following base station is always placed in this last timeslot or field 308. Naturally, some other field or timeslot of the frame could also be assigned as the unchangeable predetermined field. It is also possible to modify the structure of the entire data transmission frame between the base stations dynamically such that all data contained in the data transmission frame is placed in a new position in the frame at each base station. Further, it is also possible to mark with an identifier the timeslot or field in which the configuration data to be transmitted is placed. It is then sufficient to transmit these identifiers to the following base station, and the following base station is able to detect the configuration data intended for it in the frame transmitted and to use the data for searching and detecting the data, e.g. voice channels, intended for it.

Fig. 4 shows a schematic view of a data transmission frame of the invention over a data transmission link between the first BTS 1 and second BTS 2 base station. The fields 301, 303, 304, 305 and 306 of the frame to be transmitted are the same as those of the data transmission link described above, i.e. they correspond to the fields of Fig. 3. A new feature as compared with the above data transmission link is that the calls (or other data) transmitted to the first base station BTS 1 have been removed from the field 302, and the field 401 is thus not in use. Naturally, something else could have been placed therein. The most significant change

in regard to the above transmission link is that the field 308 does not contain the configuration data transmitted to the base station 1 but that the base station 1 BTS 1 has placed therein the configuration data intended for the base station 2 BTS 2. Further, the field 307 in which the configuration data intended for the second base station BTS 2 was placed on the first transmission link is not in use 402 or some other data may have been placed therein. The basic idea of the invention is that the first base station collects the configuration data intended for it from a predetermined field or timeslot and disposes the configuration data needed by the following or second base station in that same field, the configuration data informing the base station in which part of the frame the useful data, such as a voice channel, intended for it is located.

Fig. 5 shows a database of a base station controller BSC or possibly of a switching centre of a cellular radio system. In this database the user has defined the call capacity intended for each base station. A network configuration entity (shown in Fig. 6) located in the base station controller BSC transmits to each base station transmission means that contacts it the configuration data needed by that particular base station. On the basis of the configuration data the base station concerned detects the call or other data intended for it in the frame structure of the Abis interface. The table shows it to the configuration entity of the base station controller how much transmission capacity it must allocate for traffic between itself and each base station.

Fig. 6 shows the elements needed in automatic configuration of a base station network. According to the invention, when the current is switched on in base stations BTS 1 601 and BTS 2 602, the base stations try

to establish a connection with the base station controller BSC 600 through the Abis network. At first only the first base station BTS 1 manages to establish a connection since it uses a predetermined channel. The predetermined channel may be e.g. the last channel of the frame. In the base station controller, transmission of configuration data to the base stations is controlled by a network configuration entity 604. The base station controller BSC responds to the first base station on this channel. The other base stations are not able to establish a connection since BTS 1 is not yet ready to pass data to them. The base station controller BSC transmits to BTS 1 the configuration data intended for it, the configuration data comprising the list of Abis timeslots intended for the first base station and data for other base stations about cross-connection of timeslots intended to be performed by that particular base station. The table 603, which contains this data, is e.g. of the type described in Fig. 7. It is seen therefrom that the second base station BTS 2 receives the configuration data it needs in a timeslot 32 allocated to it for operation and maintenance O&M signalling, and is thereby able to establish a connection with the base station controller BSC 600. The cross-connection can be performed in either direction: for BSC -> BTS connection, 31 is connected to the channel 32, and for BTS -> BSC, vice versa. The corresponding configuration data including the cross-connection table is then transmitted to the second base station BTS 2. The last BTS of the network does not need cross-connection data: when base stations are connected in series, the last base station is (logically) not followed by a base station that would require cross-connection. Further, the cross-connection may be a free cross-connection, which means that any

timeslot can be transferred to any other timeslot when the data stream passes through the transmission means.

Transmission means 606, 608 is the unit of the base station 601, 602 that allocates Abis channels (timeslots) to the base station and performs the desired cross-connection of the data stream passing through the base station to the other base stations. Transmission means of this kind are already available.

Fig. 6 also shows that calls and operation and maintenance data O&M are passed through the transmission means 606 to the first base station BTS 1 601. The corresponding data is transmitted to the second base station BTS 2.

The base stations of a cellular radio network can be connected such that they form a ring, to ensure that the connection between the base station controller BSC and the base stations BTS is maintained although the connection from one direction fails. Data can then be transmitted by using the other connection of the base station ring. In Fig. 6, the connection of the base stations such that they form a ring is indicated by reference number 609. Whether or not the connection between the base stations and the base station controller is maintained depends on where the base station ring breaks.

Fig. 8 shows a flow diagram for the configuration of the base station network. In the first step, the current of the base stations of the network is switched on 801. Then the first base station BTS 1 informs 802 the base station controller BSC that it is ready for configuration. The first base station performs the configuration by using the channel 32, i.e. the last channel of the frame or an otherwise fixed channel. The base station controller BSC then configures 803 the first base station BTS 1 by using the channel 32. The Abis

transmission means of the base station BTS 1 is then initialized to collect the desired channels from the desired timeslot for the first base station, and to transfer to the following base station or base stations the channels needed by them. Being able to signal with the base station controller BSC on the A-bis channel 32, the base station BTS then establishes a connection 804 with the base station controller BSC. The other base stations BTS are then initialized 805 on the same principle, and after this the base station network is ready 806 to operate. If the configuration of the network is to be modified when the network is already in operation, this can be performed on the above principle, starting with the base station whose voice channel number is to be changed.

Fig. 9 shows a schematic view of a frame structure of an Abis interface. The transmission rate of the Abis interface is e.g. 2 Mbit/s, divided into 32 timeslots of 64 kbit/s. In the solution of the invention, the transmittable network configuration data is placed in a predetermined timeslot, such as here the last timeslot, which is used for transmitting operation and maintenance data to the base stations.

Fig. 10 shows a schematic view of a base station network to which base stations 1001 and 1003 are connected by their transmission means 1002 and 1004. If necessary, the transmission means reorganizes the 64 kbit/s timeslots located in the 2 Mbit/s frame of the Abis interface. This takes place as the frame "passes" through the transmission means. The order in which the base station puts the timeslots that have passed through it is determined by configuration, i.e. by giving the necessary configuration data to the transmission means e.g. on the operation and maintenance channel of the transmission link.

Fig. 11 shows a flow diagram of the configuration of a base station network. In step 1101 the network user designs a configuration table for the network. The base station controller BSC then transmits 1102 the configuration data needed by the nearest base station to the transmission means of that base station in a predetermined timeslot, e.g. in the timeslot allocated for operation and maintenance. The first base station then operates in a way as a repeater and transmits to the following base station the configuration data transmitted by the base station controller. In other words, the base station controller BSC transmits 1103 the configuration data needed by the following base station to said base station.

The drawings and the description thereof are to be understood only as illustrating the idea of the invention. The data transmission method and system of the invention may vary in their details within the scope of the claims. Although the invention is described above mainly as applied to a GSM system, it may also be used in other cellular radio systems. With regard to the modifications of the invention, it should especially be noted that any timeslot can be permanently assigned as the timeslot used for transmission of configuration data. In the present example this timeslot is the last timeslot available, but it may also be any other timeslot and even vary from one base station to another, as long as each base station receives information indicating where the configuration data intended for it is located. However, in the beginning the timeslot must be fixed; otherwise it would not even be possible to send network configuration commands to a base station and the base station would not be able to receive them.

In one alternative embodiment of the invention the base station BTS can also configure the Abis inter-

face or transmission means without the help of the base station controller BSC. The automatization degree of the invention can thus be raised at the base stations. Each base station then makes a certain initial setting, which the base station controller BSC can later modify base station-specifically, if necessary.

Claims

1. A data transmission method in a cellular radio system, comprising as network elements a base station controller (BSC) and base stations (BTS 1, BTS 2) connected in series thereto via data transmission links;

in the method, data is transmitted over said data transmission links in frames (Fig. 9) divided into timeslots; and the method is c h a r a c t e r i z e d in that

configuration data (308, 403) indicating in which timeslots of the frame the useful data (302, 303, 304) intended for the network element is carried is transmitted to the network element in a predetermined timeslot (308, 403) of the frame.

2. A data transmission method according to claim 1, c h a r a c t e r i z e d in that on the basis of said configuration data (308, 403), the network elements (BTS 1, BTS 2) receiving the data collect the useful data (302, 303, 304) intended for them from different timeslots of the frame.

3. A data transmission method according to claim 1 or 2, c h a r a c t e r i z e d in that said configuration data (308, 403) indicating in which timeslots the useful data (302, 303, 304) intended for the network element is carried is placed in the operation and maintenance channel that is transmitted over the data transmission link and is used for otherwise controlling the base station.

4. A data transmission method according to claim 1, 2 or 3, c h a r a c t e r i z e d in that said configuration data (308, 403) is placed in the last timeslot of the frame on the data transmission link.

5. A data transmission method according to

claim 1, 2, 3 or 4, c h a r a c t e r i z e d in that said configuration data (308) intended for each network element (BTS 1, BTS 2) is transmitted to a first network element (BTS 1) in a predetermined timeslot (308) of the frame, and the configuration data indicating in which timeslot of the data transmission link the useful data (303) intended for a second (BTS 2) network element is carried is transmitted to the first network element in another timeslot (307) of the frame, whereby the configuration data indicating in which timeslot of the data transmission link the useful data intended for the second network element is carried is transmitted from the first network element to the second network element in said predetermined timeslot (403) of the frame.

6. A data transmission method according to claim 5, c h a r a c t e r i z e d by the following steps:

a first network element (BTS 1) receives configuration data indicating in which timeslot the useful data (302) intended for the first network element is carried in a predetermined timeslot (308), and configuration data indicating in which timeslot the useful data (303) intended for the second network element is carried in another timeslot (307);

the first network element (BTS 1) transfers the configuration data (307) indicating in which timeslot the useful data (303) intended for the second network element (BTS 2) is carried from the second timeslot (307) to the predetermined timeslot (308);

the first network element (BTS 1) transmits the configuration data indicating in which timeslot the useful data (303) intended for the second network element is carried to the second network element (BTS 2) in a predetermined timeslot (403).

7. A data transmission method according to claim 1, 2, 3, 5 or 6, c h a r a c t e r i z e d in that on the data transmission link between a first network element (BSC) and a second network element (BTS 1) said configuration data is placed in the first timeslot marked with an identifier, and on the data transmission link between the second network element (BTS 1) and a third network element (BTS 2), in the second timeslot marked with an identifier.

8. A data transmission method according to claim 7, c h a r a c t e r i z e d in that the identifier of said first timeslot marked with an identifier is transmitted to the first (BSC) and second network element (BTS 1), and that the identifier of said second timeslot marked with an identifier is transmitted to the second and third (BTS 2) network element.

9. A data transmission method according to any one of the preceding claims, c h a r a c t e r i z e d in that the configuration data intended for each network element and transmitted between a first (BTS 1) and second network element (BTS 2) is placed in predetermined timeslots such that the configuration data intended for the second network element is in a predetermined timeslot (308) and the configuration data intended for a third network element is in another timeslot (307); in the method

the second network element (BTS 1) transfers the configuration data intended for the third network element (BTS 2) to said predetermined timeslot (403),

the second network element transmits the configuration data intended for the third network element (BTS 2) to said third network element.

10. A data transmission method according to any one of the preceding claims, wherein the configuration data is transmitted over a transmission path on which

the network elements (BSC, BTS 1, BTS 2) are located one after another, each part of the transmission path between two consecutive network elements forming one transmission link, c h a r a c t e r i z e d in that in each network element the configuration data is placed in a transmission frame in such a way that the configuration data needed by the network element at the end of the following transmission link is in a predetermined fixed timeslot (308, 403).

11. A data transmission system in a cellular radio system, comprising as network elements a base station controller (BSC) and base stations (BTS 1, BTS 2) connected in series thereto via data transmission links; in the data transmission system, data is transmitted over said data transmission links in frames divided into timeslots; and the system is c h a r a c t e r i z e d in that

the configuration data (308, 403) that is intended for the network elements and indicates in which timeslots of the frame the useful data intended for the network element (BTS 1, BTS 2) is carried is placed in a predetermined timeslot of the frame.

12. A data transmission system according to claim 11, c h a r a c t e r i z e d in that said configuration data is placed in the operation and maintenance channel transmitted over the data transmission link.

13. A data transmission system according to claim 11 or 12, c h a r a c t e r i z e d in that said configuration data is placed in the last timeslot of the frame of the data transmission link.

14. A data transmission system according to claim 11, 12 or 13, c h a r a c t e r i z e d in that said configuration data intended for each network element (BTS 1, BTS 2) is placed in a predetermined

timeslot (308) of the frame for transmission to a first network element (BTS 1), and the configuration data indicating in which timeslot (303) of the data transmission link the useful data intended for the second network element is carried is placed in another timeslot (307) of the frame for transmission to the first network element (BTS 1), and the configuration data indicating in which timeslot of the data transmission link the useful data intended for the second network element is carried is placed in said predetermined timeslot (403) of the frame for transmission from the first network element (BTS 1) to a second network element (BTS 2).

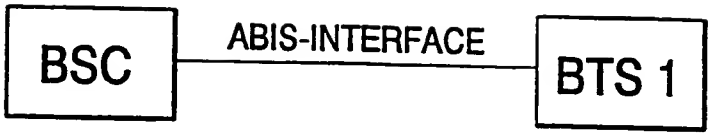


FIG. 1

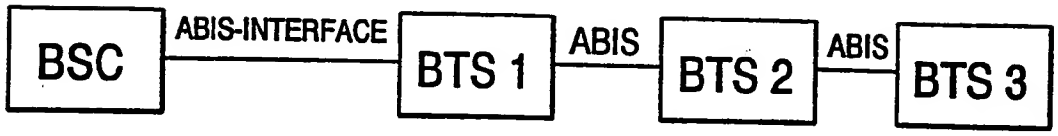


FIG. 2

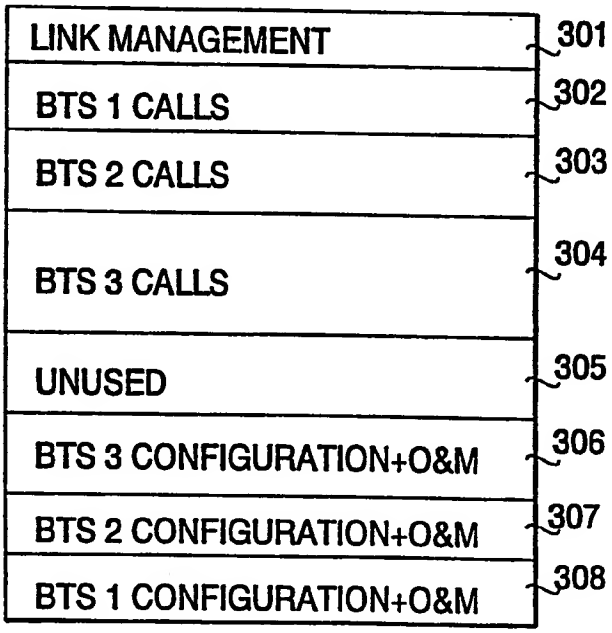


FIG. 3

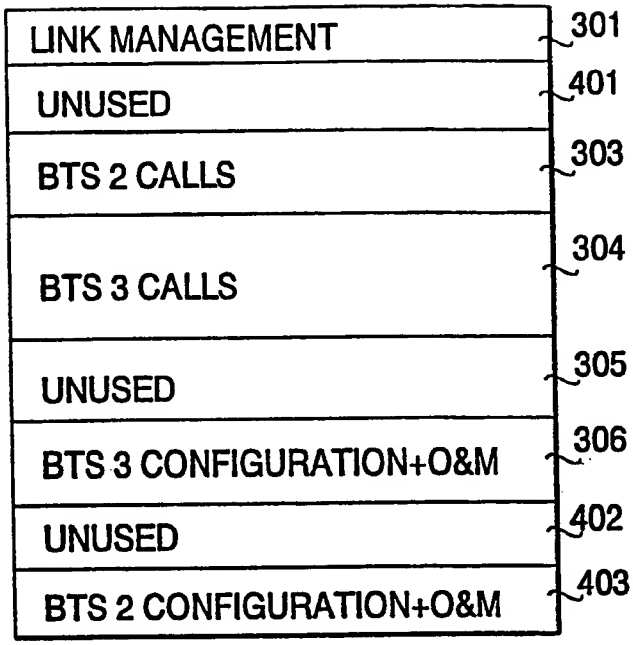


FIG. 4

BTS No	CHANNELS USED
BTS 1	5 CHANNELS
BTS 2	2 CHANNELS
BTS 3	1 CHANNEL

FIG. 5

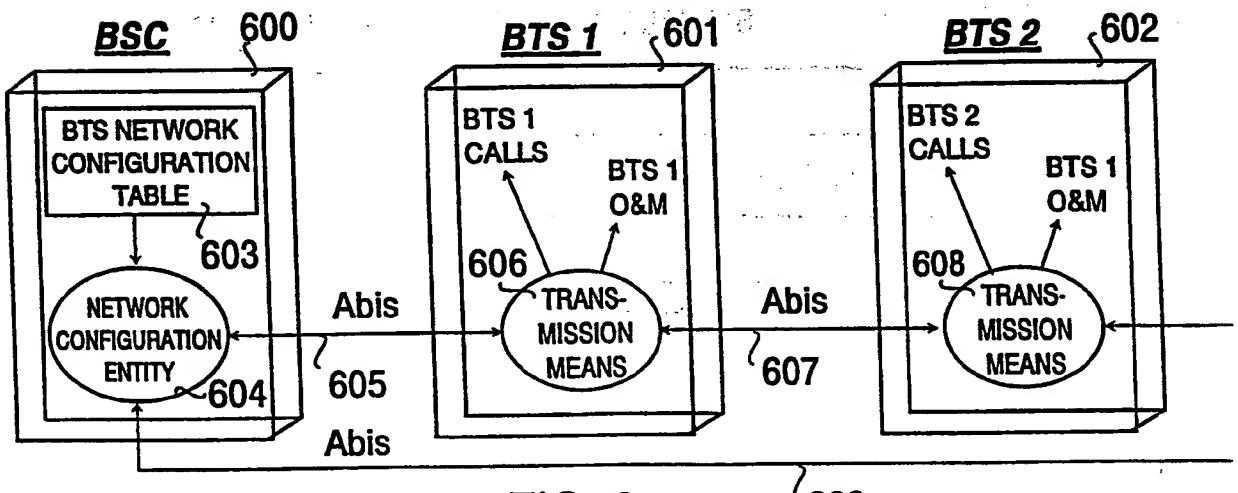


FIG. 6

ABIS-TIME SLOTS	CROSS-CONNECTION
2, 3, 4, 5, 6 (5 IN ALL)	31 ⟺ 32

FIG. 7

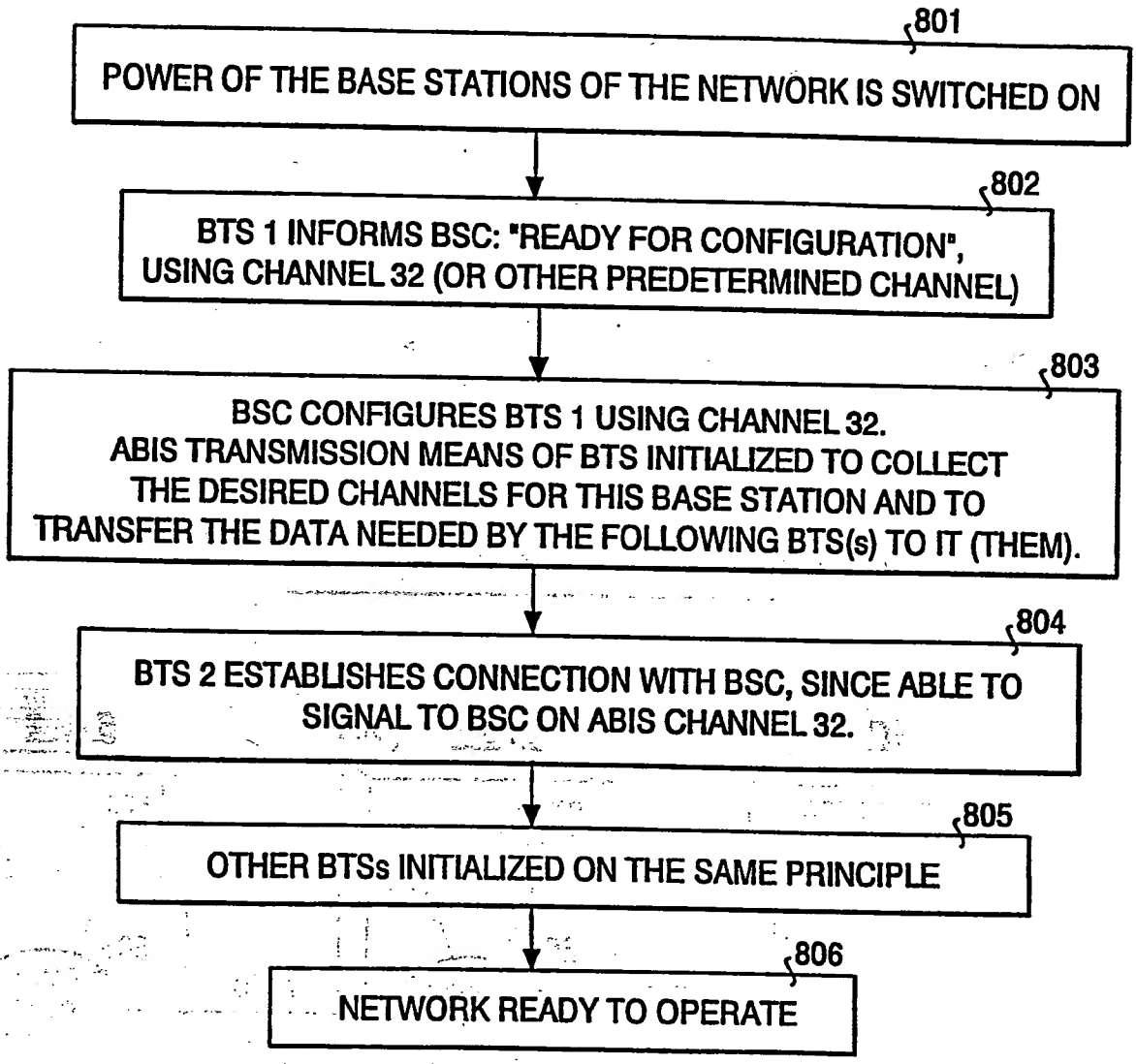


FIG. 8

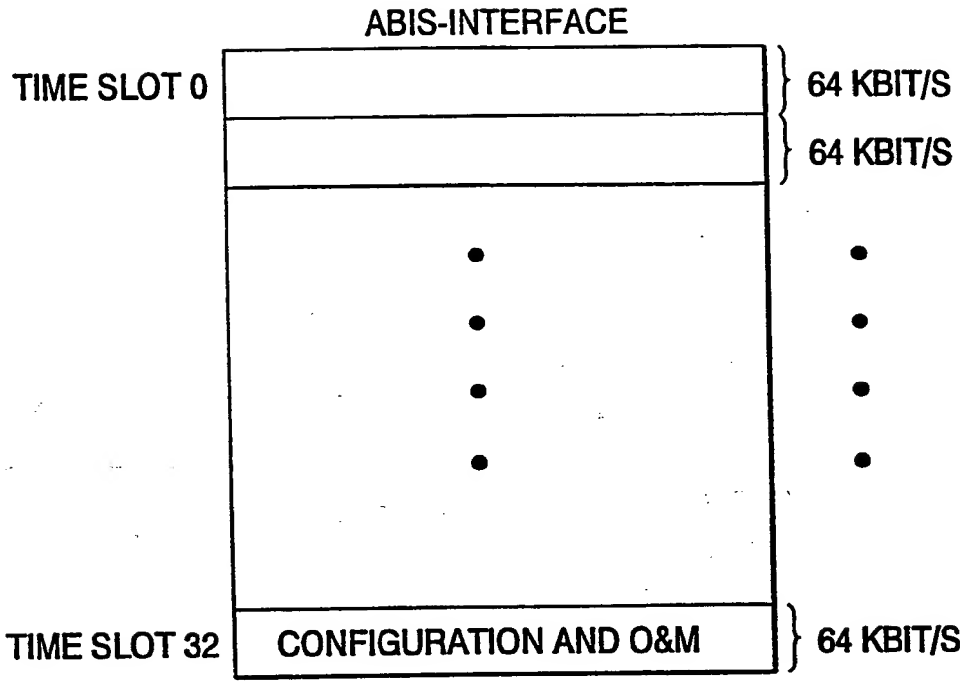

ABIS-INTERFACE
TIME SLOT 0
64 KBIT/S
64 KBIT/S
TIME SLOT 32
CONFIGURATION AND O&M
64 KBIT/S

FIG. 9

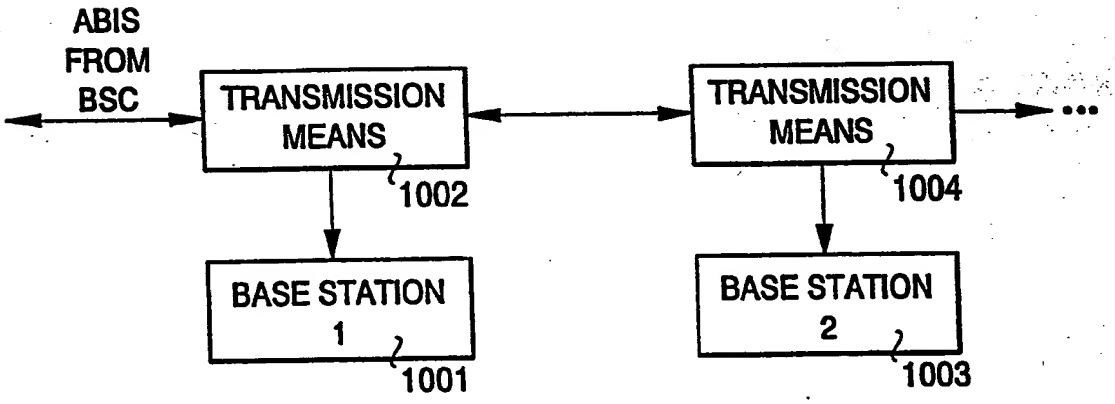

ABIS FROM BSC
TRANSMISSION MEANS
1002
TRANSMISSION MEANS
1004
BASE STATION 1
1001
BASE STATION 2
1003

FIG. 10

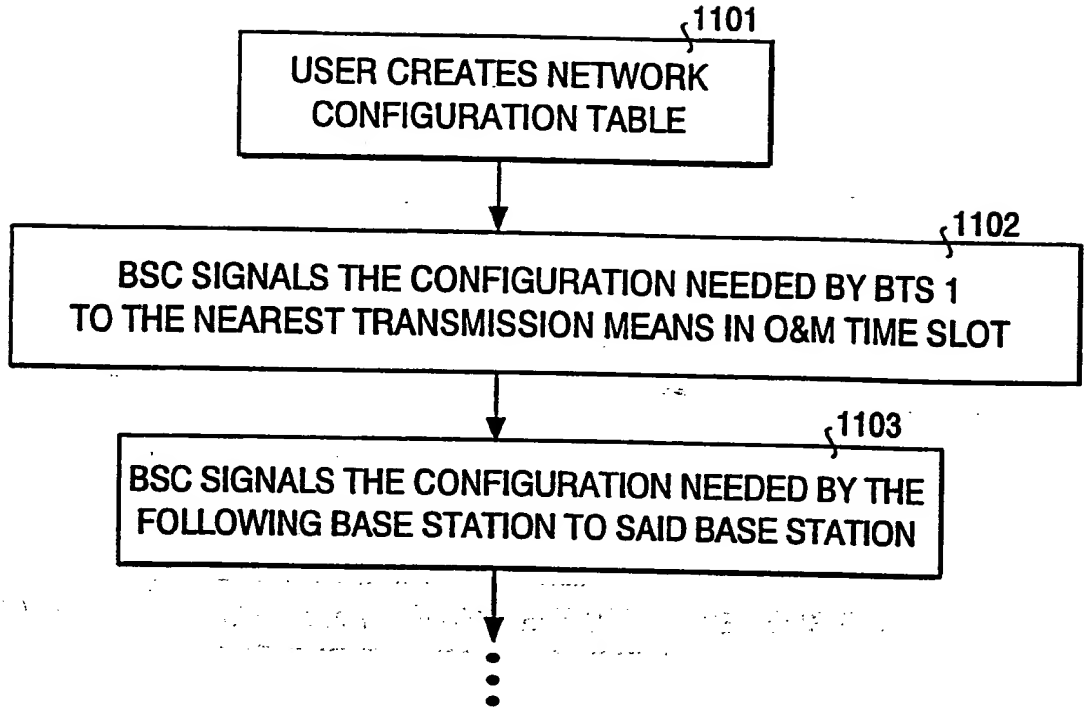
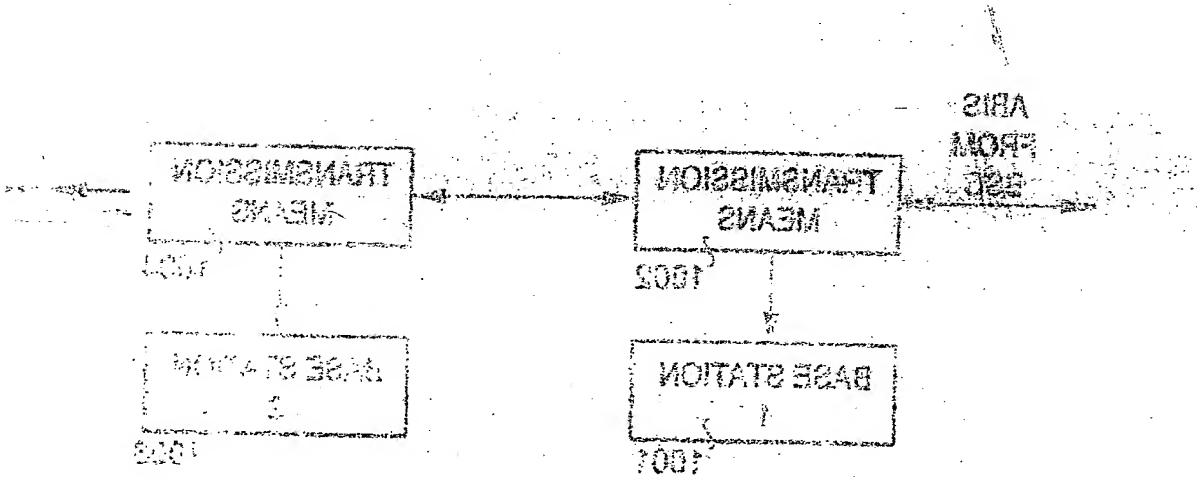

1101
USER CREATES NETWORK CONFIGURATION TABLE
1102
BSC SIGNALS THE CONFIGURATION NEEDED BY BTS 1 TO THE NEAREST TRANSMISSION MEANS IN O&M TIME SLOT
1103
BSC SIGNALS THE CONFIGURATION NEEDED BY THE FOLLOWING BASE STATION TO SAID BASE STATION

FIG. 11



INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 94/00268

A. CLASSIFICATION OF SUBJECT MATTER

IPC : H04J 3/16, H04J 3/24
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC : H04J, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CLAIMS, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP, A2, 0483788 (NEC CORPORATION), 6 May 1992 (06.05.92), column 2, line 14 - line 39; column 3, line 51 - column 4, line 5, figures 2,6	1-14
X	EP, A2, 0428407 (DIGITAL EQUIPMENT CORPORATION), 22 May 1991 (22.05.91), page 8, line 21 - line 23; page 14, line 44 - line 50, figures 8,9A, abstract	1-14
A	US, A, 4942570 (MICHAEL D. KOTZIN ET AL), 17 July 1990 (17.07.90)	1-14

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"B" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 October 1994	10 -10- 1994
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Göran Magnusson Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 94/00268

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4928274 (KLEIN S. GILHOUSEN ET AL), 22 May 1990 (22.05.90) --	1-14

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT
Information on patent family members

27/08/94

International application No.
PCT/FI 94/00268

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A2- 0483788	06/05/92	JP-A- 5022260	29/01/93
		US-A- 5271001	14/12/93
EP-A2- 0428407	22/05/91	AU-B- 627953	03/09/92
		AU-A- 6652490	23/05/91
		CA-A- 2029850	16/05/91
		JP-A- 3173235	26/07/91
		US-A- 5313467	17/05/94
US-A- 4942570	17/07/90	AU-B- 626642	06/08/92
		AU-A- 5043790	13/08/90
		CA-A,C- 2005507	23/07/90
		EP-A- 0454776	06/11/91
		WO-A- 9008434	26/07/90
US-A- 4928274	22/05/90	AU-B- 612253	04/07/91
		AU-A- 3349489	11/08/89
		EP-A- 0408587	23/01/91
		WO-A- 8906884	27/07/89